WRITTEN TESTIMONY OF
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ASSOCIATION FOR MAXIMUM SERVICE TELEVISION, INC.
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My name is James Keelor, President of Cosmos Broadcasting Corporation, which is a South Carolina company that owns eight television stations in medium-sized markets, all affiliated with major networks throughout the South and Midwest. I also am the Chairman of the Association for Maximum Service Television ("MSTV"), whose mission is to foster the technical excellence of the American public's free over-the-air community-based television stations. I am grateful for the chance to testify before this Subcommittee that is largely responsible for the great and challenging opportunity facing my industry and the American public -- the transmission of free over-the-air *digital* television to every home in every pocket of this country. It is, at long last, show time.

The topic of this hearing is spectrum management. I am not an engineer or a scientist, but as a broadcaster -- a spectrum-user -- I appreciate the importance of managing the spectrum so that services operate on the frequencies that suit them best, existing services are not unduly disrupted, efficiencies are encouraged, and innovations are facilitated by long-term planning. Broadcasting came into its own with the FCC and perhaps more than any other communications service depends on sensible spectrum management.

Without such management, the airwaves were lawless territories where users cancelled out each other's service, incompatible equipment proliferated and the public lost out. The Supreme Court lamented that, in such an environment, "[w]ith everybody on the air, nobody could be heard." *National Broadcasting Co. v. FCC*, 319 U.S. 190, 212 (1943). President Calvin Coolidge and Secretary of Commerce Herbert Hoover -- hardly known for their love of big government -- sought to order this chaos by urging Congress to create an expert agency to manage the spectrum. Shortly thereafter, enterprising broadcasters used their spectrum allocation to create a service that changed the nation. The high definition, computer-friendly future of this service stretches brightly before us thanks to the same wise spectrum management approach.

I. The Importance of Vision in Managing Spectrum

Wise spectrum management depends on a vision of what types of services need spectrum allocations and what frequency bands are best suited for each service. Cellular telephony is one child of this vision. The FCC rezoned a portion of the spectrum without significant disruption. Businesses, assured of a dedicated band, were invited to design and invest in the cellular technology, which ultimately led to the development of wireless communications technologies such as PCS and other services that benefit consumers. Satellite broadcasting, wireless cable and numerous other wireless services provide other examples of adapting spectrum allocation policies to new technologies and services.

The birth of advanced digital broadcast television ("DTV") will be attributable to the same kind of vision for broadband video -- to the FCC's and this Committee's commitment to identifying the appropriate spectrum for the conversion to DTV and fostering the research and development that would get us here. Ten years ago, the FCC was poised to reallocate the UHF channels to other services. These were channels that then appeared unusable for broadcast television, but which broadcasters believed would be necessary to launch advanced television. In February of 1987, MSTV, the National Association of Broadcasters, and 56 other broadcast organizations petitioned the FCC to refrain from reallocating any UHF broadcast spectrum until it had determined what the advanced television spectrum needs would be. The FCC had the vision to launch an inquiry, even though advanced television was still just an idea.

That same year, this Subcommittee held one of the first hearings on advanced television. Then-Chairman Markey and others on both sides of the aisle challenged the broadcasting and equipment manufacturing communities to commit themselves and their resources to the development of an advanced television system that would rival the systems being developed overseas. Under the guidance of the FCC's Advisory Committee on Advanced Television Systems, we have met that challenge. The FCC is now poised to loan specific channels within the existing broadcast allocation to broadcasters for a transition period to broadcast DTV alongside of the existing NTSC service until the NTSC

service can be switched off, one of the two channels returned to the FCC, the DTV channels repacked into a narrower band, and the remaining spectrum reallocated in clear blocks to other uses.

At any time over the past ten years, had the vision wavered, DTV would have died. For example, the FCC might have re-allocated some of the UHF channels that will now carry DTV. Industry might not have pursued the digital option that makes it possible, through compression technologies, to increase five times the amount of information a single channel can carry. The FCC and the industry might not have designed cooperatively a channel allotment table that exploits the genius of digital to assign each existing television station a new DTV channel without going outside television's existing spectrum. Congress might have put broadcast spectrum on the auction block, thereby preventing the public's free over-the-air broadcasting system from migrating intact to digital.

Threats to the fulfillment of the vision still remain. If, for example, DTV channels are not assigned throughout the broadcast band with a view to maximizing coverage and minimizing interference, the public's television service may be unacceptably impaired. By the same token, rushing the transition to a conclusion before consumers have had time to purchase reasonably priced receivers could compromise the goals of universal service and the protection of consumer investment. Congress and the FCC should not now forsake the vision that launched the DTV process in the first place for potential

short-term gains. Instead, they should preserve the block allocation in which DTV will operate with NTSC until the NTSC service is discontinued and the television allocation can be significantly reduced.

II. Spectrum Management Principles

Set forth below are basic considerations that should bear on all spectrum allocation decisions, but are described in terms of DTV.

A. Long-Range Planning

Although the market and market proxies like auctions may be effective tools in assigning particular licenses among potential users within a given service, these tools cannot substitute for the vision that made cellular and now DTV a reality. Spectrum policymakers -- namely the FCC, NTIA, and the Congressional committees with substantive jurisdiction -- have a responsibility to make deliberate decisions that take into account the fundamental laws of physics, engineering realities, and the long-term needs of different types of services (*i.e.*, video, voice and data, audio, two-way, one-way). As discussed above, the satisfaction of short-term needs (*e.g.*, for more land mobile channels) cannot substitute for wise spectrum management that takes the longer view (*e.g.*, the transition from analog to digital television). B. Spectrum Efficiency

Efficiency is undoubtedly one of the highest values in spectrum planning. Since spectrum use is about the conveyance of information, efficiency should be defined as the use of the greatest information capacity in every frequency channel, rather than simply the greatest number of users or services

packed into a particular band. In addition, information capacity must have a quality component. Thus, for example, FM radio is no less efficient than AM radio even though FM radio channels are 20 times wider than are AM radio channels. With this additional bandwidth and a different modulation method, FM radio provides substantially higher fidelity broadcasts, greatly reduces the background hiss, and improves the robustness of the signal against fading. As a result, FM radio conveys better information, albeit in a larger channel.

Television broadcasting has always been a reasonably efficient use of the spectrum and DTV will make it far more so. Television broadcasters deliver free, universal service to 98 percent of the American public (more than enjoy indoor plumbing or telephones) on *only 402 MHz* -- or only 1.34% of the spectrum below 30,000 MHz. Until now, broadcasters have continuously improved the service they provide -- upgraded technical quality and added color, stereo sound, second-language audio, and services for the hearing-impaired -- without radically changing their transmission technology or the requirements for receivers. Now broadcasters are about to undertake the costly and risky evolution to DTV by continuing existing service to analog receivers and using transitional channels within the existing television spectrum allocation to serve new, digital receivers. When the transition to digital has been completed, broadcasters will return to a single channel, turn back the other channel to the FCC for other uses and thereby actually *decrease* the total amount of spectrum allocated for television channels overall by at least 34%.

Despite this record of increasing efficiency, some in Congress have sought to pare down and reallocate portions of the broadcast band over the past 18 months. With this intense scrutiny of the broadcast spectrum, there has been little examination of other allocations. The following puts the broadcast allocation in context.

- **The United States government has access to some 65 percent of spectrum below 30 GHz. It has exclusive rights to at least 10 percent of the prime spectrum below 30 GHz.**

- **Private users -- including utilities and the petroleum industry, as well as state and local governments -- have available some 16,000 MHz of exclusive and shared spectrum for internal voice and data transmission uses.**

- **Common carriers -- generally local telephone companies, long distance companies and cellular carriers -- have access to some 14,000 MHz of shared and exclusive spectrum.**

- **The FCC has allocated to a handful of companies in the direct broadcast satellite industry a shared allocation of 500 MHz of spectrum -- more than is allocated for all the television channels in the United States.**

The sheer amount of spectrum allocated to other industries dwarfs the amount of spectrum used to provide free, universal television service to the American public. That is not to say, however, that these spectrum allocations are inappropriate. The FCC (and NTIA) must assess each allocation on its own merits in light of the efficiency concerns discussed above and the long term needs of other services.

C. <u>Carefully Tailored Allocation and Assignment Decisions</u>

In enacting the Omnibus Budget and Reconciliation Act of 1993

which gave the FCC auction authority for the first time, Congress wisely decided to forbid the FCC from making spectrum allocation decisions for the purpose of garnering auction revenues. In doing so, Congress recognized the importance of the FCC's deliberative process in mapping spectrum according to the various characteristics and demands of different services and consistent with the overall public interest. In appropriate circumstances, market mechanisms may help to determine the features and viability of a given service. They may also provide incentives for services to use spectrum more efficiently. But they cannot do what policymakers must do -- make basic allocation decisions that then permit the market to select among various options (*e.g.*, between higher and lower quality radio broadcasts, between video and voice and data services).

Policymakers must make the appropriate decisions about how much spectrum to allocate in what frequency band and determine what restrictions should be placed on its use for each type of service. In doing so, they must recognize the distinct features of different services. The technical characteristics of broadcasting illustrate some of the features that should bear on allocation decisions. Terrestrial broadcasters transmit an unusually large amount of data in a format (namely video) that is extremely quality-sensitive. These transmissions occur over more than 1600 local stations in a hostile physical environment and are subject to unique interference concerns. Another 1600 DTV stations must be added to the same amount of spectrum without

unduly disrupting the existing service. Finally, unlike their competitors in the video services market, broadcasters operate in an "open-loop" system in which they control only the transmitting end of the transmission/reception loop. These considerations dictate the way in which broadcast spectrum should be managed generally and how the transition to DTV must be engineered. In short, the broadcast allocation should be exclusive and DTV channels assigned so as to minimize interference to the public's existing service.

Video Service. **Allocation decisions should both ensure that there is sufficient contiguous spectrum for broadband video applications and respect the special characteristics of video in any given allocation. There is a danger today (recognized by some at the FCC) that the Commission could over-allocate for services that are less data intensive -- particularly voice and data. With 80 MHz of additional spectrum already nearing the auction block for voice and data wireless services, serious thought should be given to putting any more on the market in the near term. An over-allocation for narrowband uses could lead to warehousing, deflated auction revenues and inefficient spectrum use. By flooding the market with small channels, it could also inhibit the development of technologies that require aggregated or wider channels.**

Interference. **Video signals, tightly packed with data, must travel in an uncongenial environment. To reach audiences as far as 65 miles from transmitters, television signals must be strong enough to navigate mountains, trees and buildings and to withstand the interference caused by multiple signals**

on the same or other nearby channels. This makes broadcasters' use of spectrum far more technically complex than that of other users. Cable and satellite television, for example, do not have to contend with the same sort of interference because they transmit in relatively protected environments.

These ordinary interference concerns will be compounded when, in the next few years, more than 1600 DTV channels are packed into the spectrum presently allocated for analog broadcasting and the DTV signals, during the transition, increase the interference potential to the public's service from analog channels. To mitigate these concerns, the FCC should assign the DTV channels using the entire broadcast band, from channels 2 to 69, so as to reduce the disruption of existing television service while securing for the public a new service that at least replicates the scope of the old. At the same time, only a whole-band approach makes it feasible to accommodate the majority of low power and translator stations in the interstices of the full power stations.

Lack of Control Over Receivers. **Television broadcasters, unlike their competitors, control only the transmission, not the reception, of their signals. Unlike other licensees, therefore, broadcasters cannot "upgrade" their operations by replacing an old technology with a new one. Simply switching the transmission mode in one fell swoop would make obsolete the American public's investment in approximately 200 million existing television receivers. The "open-loop" quality of terrestrial broadcasting makes it particularly difficult to set deadlines for the transition to DTV. Regardless of how fast broadcasters**

move to build DTV stations, the pace of the transition may depend on consumers' willingness to purchase equipment that can receive the signals. Broadcasters have every incentive to shorten the transition time as much as they can. No one relishes the prospect of operating two stations, with double the bills for power and other operating costs. Some 10 broadcasters have already applied for experimental HDTV stations and at least three are operating. Proposals that would set artificial deadlines for the transition ignore both broadcasters' natural incentive to move the transition quickly and their inability to control its pace.

Point-to-Multipoint Service. **Unlike most other services, broadcasting is, by nature, a point-to-multipoint service. This means that television transmitters radiate signals in a 360° arc to homes at distances of 65 miles or more. While this intensive usage utilizes the frequencies to their fullest, it makes it impossible for broadcasters to share spectrum as other services might. Proposals to permit other uses of the television band, particularly by mobile services, ignore this reality. Mobile transmit and receive operations, if inserted into the television band, would cause destructive interference to television service. By the same token, if the FCC adopted rules to protect the television service, the mobile assignees could only use slivers of any given channel, thus decreasing the efficiency of the spectrum use.**

The FCC should refrain from requiring interservice sharing among incompatible services in general and from requiring that broadcast services

share with point-to-point services in particular. Land mobile and television sharing of broadcast channels 14-20 has been problematic. Complaints of interference to and from broadcast stations has plagued the sharing arrangement. These complaints were most recently voiced in the FCC's DTV allotment/assignment proceeding in which a significant number of land mobile users complained that the assignment of certain DTV channels would interfere with their operations. The surest way to avoid these problems is to locate DTV and land mobile in separate bands so that each service can use its allocation most efficiently.

III. Managing Uncertainty

Spectrum allocation decisions are made on the basis of the best available science, engineering and practical judgements at the time. New technological developments and experience in the field could yield changes to initial decisions. The FCC, to its credit, has shown an increasing willingness to implement refarming (*e.g.*, in the 450 MHz band) and other spectrum management techniques when it appears that technological improvements have made prior spectrum allocations obsolete. Consistent with the Public Safety Wireless Advisory Committee Report (September 11, 1996), the FCC should undertake such a refarming in the 800 MHz band so that additional spectrum can be made available for public safety and other uses.

The DTV transition involves uncertainty. The DTV system has undergone a great deal of laboratory testing, but a relatively limited amount of

field testing, particularly given the varied propagation environments in which broadcast stations operate. The FCC, Congress, and the broadcast community itself, should sustain a commitment to the roll-out of DTV based on today's planning factors with an understanding that adjustments will have to be made in response to in-the-field experience and practical implementation problems. These adjustments could create new opportunities for accommodating low power and translator stations and, perhaps, other services.

Assignment of DTV channels throughout the entire band is necessary. In the major markets, there is virtually no flexibility in the assignment of DTV channels, as there are barely enough channels to assign one to each station. The assignment of these channels affects, through a chain of interference, the assignment of all other channels across the country and vice versa. Thus, removing certain channels from the assignment pool affects television coverage and interference throughout the country and threatens untenable viewer disenfranchisement. The FCC's current proposal to concentrate DTV assignments between channels 7 and 51 would cause unacceptable interference and coverage penalties. It would also take a heavy toll on low power and translator stations which would be displaced to make room for the more tightly packed full power stations. Finally, the proposal would fail to fulfill the most basic spectrum management obligation -- allocating to services the frequencies that suit them best. Channels 2 through 6 have proven their excellence at wide area television broadcast coverage over the past 50 years.

Although there is limited information on the DTV performance of these channels, there is every reason to expect that they will prove to be among the most effective and efficient in the DTV environment as well.

Proposals to reallocate some of channels 60-69 at this early stage have the same defects. In addition, these proposals suffer from the problems of interservice sharing discussed above. Both the FCC and broadcasters recognize that some DTV channels will have to be assigned in channels 60-69 no matter what steps are taken to minimize the number of these assignments. Moreover, there are more than 97 NTSC stations that currently provide service from these channels and have to be protected. Given these constraints, very few frequencies could be made available for other services in the major markets where other services most want to operate. What could be made available would be scattered across the country and could not be aggregated into a block allocation.

Undoubtedly, DTV assignments will have to be adjusted over the next few years. Many low power and translator stations will have to be shifted from their current channels to substitute channels. In order to achieve an efficient use of the broadcast spectrum, the FCC should open a window of time for these adjustments to be made relatively easily so that the DTV service can be developed quickly and with as little disruption as possible. Once the service is underway, responsible adjustments can be made, looking toward the final reallocation of significant amounts of broadcast spectrum at the end of the transition. But these adjustments should be implemented after the issuance of

the carefully designed DTV allotment table -- an exemplary exercise of the FCC's spectrum management function.

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Wise spectrum management has made DTV and other new technologies like DBS and wireless cable possible. By zoning for particular uses, planning for long-term spectrum needs and spurring services toward greater efficiencies, the FCC can foster competition among the broadest array of communications products.